An experimental study of diuron and imazapyr herbicide effects on phytoplankton assemblages in the San Francisco Estuary

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Abstract: Herbicides may be used widely within estuarine watersheds and have the potential to negatively affect estuarine organisms living downstream of the site of their application. Diuron is one herbicide of concern in the northern San Francisco Estuary (SFE) because it is used extensively and persists for long periods in the environment. Despite measured concentrations in the SFE, little is known about the potential impact of diuron on phytoplankton communities. A second herbicide in use in the SFE is imazapyr, which is applied to marsh habitat for control of invasive plants. Imazapyr is not currently monitored in the SFE. This study investigated the effects of additions of diuron and imazapyr on carbon assimilation, nitrogen uptake and community composition of natural phytoplankton assemblages collected in the SFE. Diuron reduced carbon assimilation at concentrations within the range of diuron concentrations previously reported for the northern SFE. Carbon assimilation was reduced during both acute (t=0hr) and chronic (t=48 hr) diuron exposure treatments. Imazapyr did not negatively affect carbon assimilation during acute exposure, but carbon assimilation decreased with the addition of imazapyr in chronic exposure experiments. Phytoplankton biomass and abundance decreased with increasing herbicide concentration, and the phytoplankton community composition shifted with added diuron and imazapyr. Centric diatoms as a percent of the phytoplankton community decreased while flagellates increased with the addition of diuron or imazapyr.

Statement of Relevance: It is important to understand the effect of pesticides on estuarine organisms and use that information to inform decisions about water quality issues in the San Francisco Estuary, as well as other systems.